CASE REPORTS

Infrarenal endoluminal bifurcated stent graft infected with *Listeria monocytogenes*

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Prosthetic graft infection as a result of *Listeria monocytogenes* is an extremely rare event that recently occurred in a 77-year-old man who underwent endoluminal stent grafting for infrarenal abdominal aortic aneurysm. The infected aortic endoluminal prosthesis was removed by means of en bloc resection of the aneurysm and contained endograft with in situ aortoiliac reconstruction. At the 10-month follow-up examination, the patient was well and had no signs of infection. (J Vasc Surg 1999;29:554-6.)

The general trend today is toward minimally invasive and traumatic surgical procedures. Endovascular prostheses for repair of abdominal aortic aneurysm have only recently been adopted for clinical use.[1,2] This new method is especially suitable for patients with aneurysms who are at high surgical risk and who fulfill the technical requirements for insertion of the endoluminal stent graft. The use of these prostheses, however, may involve increased risk of infection, as occurred in a patient who had endovascular abdominal aortic prosthetic graft infection as a result of *Listeria monocytogenes.*

CASE REPORT

A 77-year-old man who was obese and hypertensive was admitted for abdominal pain caused by a type B abdominal infrarenal aortic aneurysm, which had a maximum transverse diameter of 6.6 cm and a neck longer than 20 mm.[2] No signs indicating infective nature of the aneurysm were present in the spiral computed tomographic (CT) scan. A bifurcated stent graft (Vanguard 26/12/153, Meadox, Oakland, NJ) was implanted with limbs that terminated in the common iliac arteries, and an additional short stent graft (Passager 12/60, Meadox) was necessary to control leakage in the distal left limb of the graft. The procedure was performed in the operating theater. A dose of 1.5 g of cefuroxime and 1 g of vancomycin hydrochloride was administered as antibiotic prophylaxis.

A moderate postimplantation syndrome with fever developed without leukocytosis and with marked elevation of C-reactive protein (CRP) concentration (range, 19 to 92 mg/L), which lasted for several days. Five days later, a control duplex scan examination showed neither leakage nor expansion of the aneurysmal sac and the patient was discharged. Two months later, he was doing well and the spiral CT scan results were unremarkable. Twelve weeks after implantation, the patient was admitted for sepsis with a temperature of 40°C. His general condition was poor, and he had low back and abdominal pains that radiated to the inguinal regions. Laboratory test results showed an elevated white blood cell count and a marked increase in CRP level (165 mg/L). At this stage, the CT scan revealed only a thrombosed aneurysmal sac around the endovascular stent graft, with no intensification with contrast liquid and nothing specific about the graft infection. Antibiotic treatment was begun with vancomycin hydrochloride (500 mg, four times daily) and imipenem (1 g, three times daily). The blood cultures were sterile. To exclude acute appendicitis, an appendectomy was performed through the transverse incision because of the lower abdominal pain, fever, and high CRP level. The appendix was not inflamed, and no intra-abdominal focus was observed.

A scan with indium-labeled leukocytes showed a focus of increased activity corresponding to the region of the infrarenal abdominal aorta. Bacterial cultures taken from the aneurysmal sac or perigraft space with fine needle under ultrasound scan guidance yielded *Listeria monocytogenes*, which thus confirmed the infection of the endoluminal stent graft. Transesophageal echocardiography was performed to rule out endocarditis-related infected aneurysms but revealed no evidence of endocardial vegetation. The previously started antibiotic regimen was dis-

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continued and changed according to tests of antibiotic resistance to ampicillin (2 g, six times daily) and netilmicin (300 mg, once daily). Surgery was postponed to better control the septicemia with antibiotics. Fourteen days later, no proper response was achieved with appropriate antibiotics alone—the patient was febrile and the CPR level remained between 150 and 200 mg/L. The decision for laparotomy and surgical strategy was planned in advance when the negative blood cultures and low virulence of the organism were considered.

At laparotomy (ie, 2 weeks after appendectomy), inflammation surrounded the aneurysmal wall and iliac arteries. The left iliac artery was thicker than the right artery. An abscess that contained a clear, green fluid was found adjacent to the aortic bifurcation between the aneurysm and vena cava, with no evidence of past or recent aortic or bowel perforation. The iliac arteries were clamped and cut below the limbs of the stent graft. The aneurysm and the iliac arteries with the prosthesis inside were then resected en bloc, upward from below without incising the aneurysm (Fig 1). The aorta was not closed until the resection reached the renal artery level. After the careful debridement of infected tissue, the operative field was irrigated with ampicillin solution. The aneurysmal sac that was removed was filled with infected thrombus. The aortoiliac continuity was restored with an in situ polytetrafluoroethylene (PTFE) bifurcation vascular prosthesis that was wrapped carefully in retroperitoneal and omental tissues. The right limb was anastomosed to the right common iliac artery, and the left limb to the left external iliac artery. The contents of the sac and samples of the endoluminal graft were cultured. All the culture results were negative, probably because of the effective antimicrobic therapy administered.

After surgery, netilmicin was discontinued and the course of antibiotics was continued intravenously for 6 weeks with ampicillin.[3,4] Recovery was uneventful, excluding several episodes of diarrhea. The patient remained afebrile, and CRP concentration decreased from the preoperative level to 20 mg/L in 10 days. A new scan with indium-labeled leukocytes that was performed 3 weeks after laparotomy revealed no activity at the operative site. At discharge, the CRP level was 11 mg/L. Antibiotic prophylaxis was continued orally with doxycycline (150 mg, once daily) for 4 weeks. At the 3-month and 10-month follow-up examinations after aortoiliac reconstruction, there was no evidence of recurrent infection or periprosthetic problems. The patient was afebrile, the latest erythrocyte sedimentation rate was 4 mm/h, and the CRP level was less than 5 mg/L.

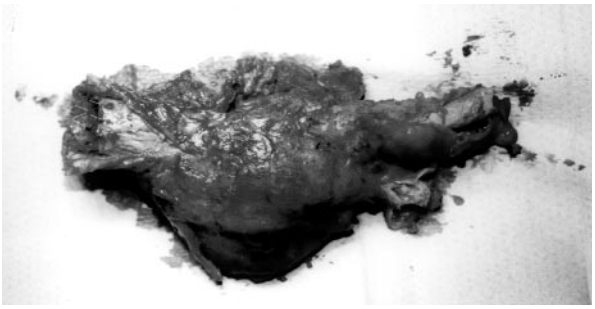

Fig 1. Abdominal aortic aneurysm resected en bloc with infected bifurcated endoluminal stent graft.

DISCUSSION

Listeria monocytogenes is a small, facultatively anaerobic, gram-positive bacillus commonly found in soil, decaying vegetation, and fecal flora of several mammals.[3,5,6] The infection probably begins after the ingestion of contaminated foods. The bacterium crosses the mucosal barrier of the intestine, passes into the bloodstream, and may disseminate hematogenously. Microbiologically, the infecting organism from the samples was confirmed with typical colony morphology and was gram-positive, catalase-positive, and esculin-positive, and the reactions were typical for *Listeria monocytogenes* with a commercial biochemical kit (Rosco Diagnostica, Taastrup, Denmark).

One could suspect that the patient had a mycotic or infected aneurysm before the stent graft was implanted because listerial bacteremia can lead to the development of arteritis or endocarditis. However, there were no signs of either silent bacteremia or infective nature of the aneurysm. Preoperative laboratory study results were unremarkable, and no clinical manifestations of central nervous system infection, the most common target of *Listeria monocytogenes* infection, were observed.[3,4] Later, transesophageal echocardiography was performed after positive bacterial cultures to rule out endocarditis-related aneurysm. The echocardiogram revealed no evidence of endocardial vegetation. The likelihood that the patient previously had mycotic or infected aneurysm and that the endovascular graft was implanted in a contaminated field was only theoretic.

Few reports are available of arterial or prosthetic graft infections caused by *Listeria monocytogenes.*[7,8] Because *Listeria monocytogenes* is an inhabitant of the bowel flora, iatrogenic insidious bowel complication during intrumentation of stent graft implantation may be considered as a possible portal of entry. The possibility cannot be eliminated, although no evidence of gastrointestinal tract complications could be found at laparotomy. However, we consider that the probable cause might be better explained by late hematogenous spreading of the microbe from the gastrointestinal tract after the patient had already been discharged.

The new endovascular stent grafting technique normally leaves the aneurysmal content intact as compared with standard aneurysm surgery. However, the aortic endothelium may be damaged during periprocedural instrumentation, which makes contamination possible in cases of infected aneurysmal content or thrombus. Routine bacterial culture of the intraaneurysmal thrombus is hardly possible, and furthermore, the value of culturing aneurysmal contents in predicting subsequent sepsis is controversial. In particular cases, a scan with indium-labeled leukocytes may be feasible to screen subclinical mycotic or infected aneurysm before endoluminal grafting procedures. Endovascular exclusion of aortic aneurysm has been proven clinically effective, but the related morbidity, including infections, remains to be seen. To date, the complications published have been embolic or related to the intervention.[2,9]

The outcome of untreated aortic graft infections or those treated exclusively with antibiotics is invariably fatal. Successful results require a combination of systemic antimicrobic administration and surgery. The principle of surgical treatment is the total excision of the infected graft. Early diagnosis and timely surgery enhance the possibility of survival. When presented with the problem, we reasoned that radical resection of the infected stent graft with the aneurysm, debridement of all infected tissue, in situ aortoiliac grafting with PTFE prosthesis, and adequate postoperative antibiotic therapy would eradicate the infection. The PTFE graft was preferred as aortoiliac prosthetic material because of minor adherence of bacteria to the PTFE fabric.

It is unclear whether single-stage in situ aortic repair should be performed in an infected field. The first choice after the removal of all infected tissue without performing vascular repair is to carefully observe the circulation to the feet and, if necessary, perform subsequent repair (eg, through the extraanatomic route). The other available options for restoration of arterial continuity to the lower extremities after graft removal are the single-stage procedure described here, the use of homografts or superficial femoral veins, or the performance of a prosthetic axillobifemoral bypass grafting procedure. The patency rate of axillobifemoral grafting, however, is clearly inferior as compared with grafting by means of the anatomical route. On the other hand, the risk of infection of any prosthetic material should be considered in the presence of bacteremia, and prolonged or even permanent antibiotic therapy should be relied on for its prevention. No cases have been published of surgical management in the event of prosthetic infection with *Listeria monocytogenes* as we described. We believe it was justified in an aged patient to perform prosthetic in situ grafting as we did. However, the type of reconstruction in the situation we detailed must be individualized. Should infection of the new graft occur, it would be possible to remove the prosthesis and plan a secondary reconstruction (eg, via the axillobifemoral route). In this case, we reported that in situ grafting was successful at the 10-month follow-up examination.

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